

Richmond Refinery LPS Bulletin – Reliability

Leaking Ports at TKN Reactor Module R-520



IPS Control: 1425422

Location: North Isomax TKN
Reactor Module R-520

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Reference: Information



Bolts at typical bottle reactor liner ports



Visible gaps at bottomed out bolts

Incident Description:

During the March 2009 catalyst change at the R-520 bottle reactor, all six liner ports were opened for a required inspection and bolted closed prior to catalyst loading. Upon startup, the Iso Jet and IsoSplitter Bottoms streams were off-spec resulting in a subsequent R-520 module shutdown on 3/26/09 to locate and correct the cause. Leak testing all components revealed leaks at the two lower liner ports where bolts securing the flange covers had bottomed out without fully sealing them. Untreated vaporized hydrocarbon feed leaked by and recombined with the reactor effluent. The leaks were corrected and the module was back online on 4/24/09. The TKN unit incurred an economic loss of \$4.1 million due to this failure.

Investigation Findings:

- 1) 1/8" gaps were left between the two bottom liner port flange covers and gasket surfaces.
- 2) Liner ports were not checked or leak tested prior to loading catalyst.
- 3) An investigation of R-510 liner damage in 2002 did not address prior problems at liner ports as a potential root cause for feed bypassing.

Lessons Learned / Business Practices:

- 1) Drawings and instructions for assembly and testing should be provided for special flanges such as bottle reactor liner ports.
- 2) Checklists must include pertinent details of each reactor as was done for the nine subsequent successful catalyst changes at Isomax and RLOP.
- 3) Loss Investigations should address all potential causal factors rather than only the proximate root cause for the incident. (see below)

Examples of Repeat Incidents due to an Unaddressed Root Causes

- 1) Shutting down to clean a fouled exchanger without taking action to locate and eliminate the contaminant.
- 2) Pump damage due to low feed rates without addressing low flow conditions within the minimum flow loop.
- 3) Replacing an overheated motor without fixing a power supply issue.
- 4) Replacing leaking compressor head gaskets without verification that the surfaces were properly machined.
- 5) Replacing leaking flanges without verifying the correct gasket material.

Tenets of Operations Violated:

- 9) Always follow written procedures for high risk or unusual situations.

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There's always time to do it right!